Compositional metric learning for multi-label classification

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Problems & Ideas

- Problems of distance metric learning for multi-label classification
  - how to represent the distance metric for multi-label classification
  - how to define the distance constraints for multi-label instances

- Ideas: Compositional Metric Learning
  - **Compositional distance metric** is employed which adopts the representation of a weighted sum of rank-1 PSD matrices based on component bases.
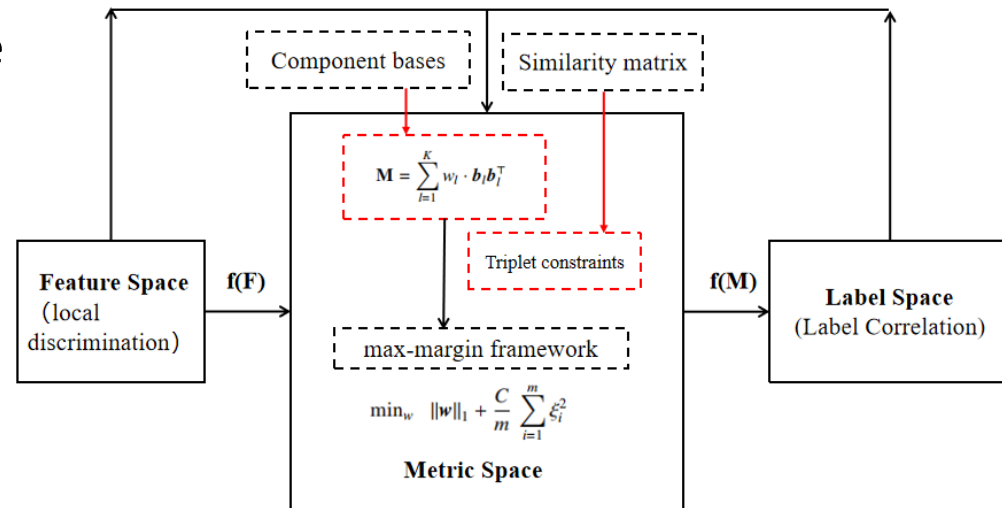 - **Triplet similarity constraints** derived from both instance and label spaces

Fig.1 The multi-label distance metric learning framework

Main Contributions

- Win/tie/loss counts (pairwise *t-test* at 0.05 significance level) between *COMMU* and the comparing approaches

	*k*NN-Commu **against**			Mlknn-Commu **against**		
	*k*NN-Lm	*k*NN-Nje	*k*NN-Original	Mlknn-Lm	Mlknn-Nje	Mlknn-Original
ranking loss	14/1/0	1/2/7	5/10/0	12/3/0	8/2/0	3/12/0
coverage	9/6/0	7/3/0	11/4/0	12/3/0	8/2/0	11/4/0
average precision	7/5/3	10/0/0	6/9/0	9/5/1	10/0/0	3/12/0
micro-F1	6/4/5	2/2/6	7/8/0	2/4/9	3/7/0	5/10/0
macro-F1	12/3/0	9/1/0	2/13/0	2/9/4	9/1/0	1/14/0
In Total	**48/19/8**	**29/8/13**	**31/44/0**	**37/24/14**	**38/12/0**	**23/52/0**

- **Parameter Sensitivity**
  Performance of *COMMU* in terms of *average precision* changes with varying value of parameter *alpha* based on *KNN* (left column) and *MLKNN* (right column) on three data sets
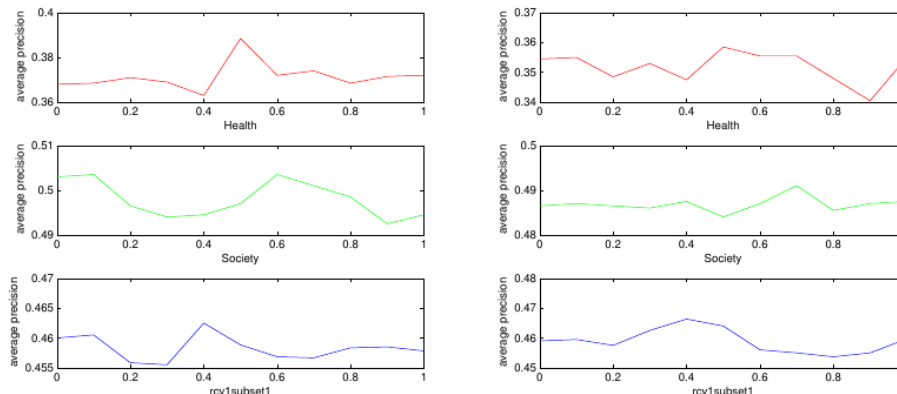
- **Effective of component bases generation**
  Performance of *COMMU* (blue bar) and *COMMU-PCA* (brown bar) based on *KNN* (top) and *MLKNN* (down) in terms of *average precision*